If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

7.1.63 Replacement of Burst Disks During Operation

Text Pages 2 through 9

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

S. Sakry

7.1.63 Replacement of Burst Disks During Operation

1. Purpose

To provide guidance on the replacement of a failed burst disk during refrigerator operations. The order of the steps and details may need to be adjusted as conditions warrant.

The OPM contains the following sections:

5.1 Replacement of Burst Disk H60R (Hi Pot)
5.2 Replacement of Burst Disk H56R (Intermediate Pot)
5.3 Replacement of Burst Disk H59R (Low Pot)
5.4 Replacement of Burst Disk H46R (CVP to HX Piping)

2. Responsibilities

2.1 The Shift Supervisor, or an Operator designated by the Shift Supervisor, is responsible for conducting the procedure, and providing documentation in the Cryogenic Control Room Log and in the Cryogenic Valve Log.

3. Prerequisite

None

4. Precautions

4.1 Personal Protective Equipment (PPE) is required for the replacement of the burst disk assembly.

4.2 If there is liquid helium in the refrigerator pots, all personnel entering the refrigeration wing of 1005R, must be ODH Class 1 qualified, have a Personal Oxygen Monitor (POM), and carry an emergency escape pack.

5. Procedure

5.1 Replacement of Burst Disk H60R (Hi Pot)

_____ 5.1.1 Notify MCR and Cryogenic Operations Group Leader of refrigerator status, and that cooling to ring will be stopped.

_____ 5.1.2 Shutdown cold turbines.

_____ 5.1.3 Stop flow to the ring by closing valve H86A, continue to operate the ring circulators.

_____ 5.1.4 Ensure main compressors are operating to provide pump back. Opening limit on valve H3025A may need to be increased.

_____ 5.1.5 Isolate high pot by closing and applying LOTO to the following valves: (Apply LOTO on the manual valve. For the automatic valves disconnect and red tag the air line.)

H90M____	H106A____
H95A____	H86A____

_____ 5.1.6 If possible, stabilize the warm end of the refrigerator. If not, shut down the warm turbines.

_____ 5.1.7 Ensure issue that caused disk to fail is being addressed.

_____ 5.1.8 When venting from the pot subsides, replace failed burst disk with spare assembly. Monitor pressure of pot as spare assembly is installed.

_____ 5.1.9 Heat area of burst disk and retighten bolts.

> **Caution:**
> While bringing refrigerator systems back on line, closely monitor temperatures and pressures.

_____ 5.1.10 Evaluate status of refrigerator warm end, including adsorber

_____ 5.1.11 If shutdown, restart warm turbines.

_____ 5.1.12 Remove LOTO and open valve H90M.

_____ 5.1.13 Remove red tag, reinstall air line, and place valve H106A in “Auto.”

_____ 5.1.14 Adjust valve H100A opening limit to control pot filling rate.

_____ 5.1.15 Remove red tag, reinstall air line, and partially open valve H95A while monitoring pot pressure.

_____ 5.1.16 Place valve H95A in “Auto.”

_____ 5.1.17 Restart cold turbines.

_____ 5.1.18 Remove red tag and reinstall air line for valve H86A.

_____ 5.1.19 To re-establish flow to the ring, match set point of valve H86A to supply line pressure.

_____ 5.1.20 Place valve H86A in "Auto."

_____ 5.1.21 Increase supply line pressure by adjusting set point of valve H86A. Monitor flow rate to ring.

_____ 5.1.22 Stabilize ring and refrigerator.

5.2 Replacement of Burst Disk H56R (Intermediate Pot)

_____ 5.2.1 Notify MCR and Cryogenic Operations Group Leader of refrigerator status, and that cooling to ring will be stopped.

_____ 5.2.2 Shutdown cold turbines.

_____ 5.2.3 Stop flow to the ring by closing valve H86A, continue to operate the ring circulators.

_____ 5.2.4 Ensure main compressors are operating to provide pump back. Opening limit on valve H3025A may need to be increased.

_____ 5.2.5 To isolate the low pot, close the following valves (remove air lines from valves and red tag):

H106A____ H54A____
H114A____

_____ 5.2.6 If possible, stabilize the warm end of the refrigerator. If not, shut down the warm turbines.

_____ 5.2.7 Ensure issue that caused disk to fail is being addressed.

_____ 5.2.8 When venting from the pot subsides, replace failed burst disk with spare assembly. Monitor pressure of pot as spare assembly is installed.

_____ 5.2.9 Heat area of burst disk and retighten bolts.

Caution:
While bringing refrigerator systems back on line, closely monitor temperatures and pressures.

_____ 5.2.10 Evaluate status of refrigerator warm end, including adsorber.

_____ 5.2.11 If shutdown, restart warm turbines.

_____ 5.2.12 Remove red tag, reinstall air line, and place valve H54A in "Auto."

_____ 5.2.13 Remove red tag, reinstall air line, and place valve H114A in "Auto."

_____ 5.2.14 Adjust valve H100A opening limit to control pot filling rate.

_____ 5.2.15 Remove red tag, reinstall air line, and partially open valve H106A while monitoring pot pressure.

_____ 5.2.16 Place valve H106A in "Auto."

_____ 5.2.17 Restart cold turbines.

_____ 5.2.18 Remove red tag and reinstall air line for valve H86A.

_____ 5.2.19 To re-establish flow to the ring, match set point of valve H86A to supply line pressure.

_____ 5.2.20 Place valve H86A in "Auto."

_____ 5.2.21 Increase supply line pressure by adjusting set point of valve H86A. Monitor flow rate to ring.

_____ 5.2.22 Stabilize ring and refrigerator.

5.3 Replacement of Burst Disk H59R (Low Pot)

_____ 5.3.1 Notify MCR and Cryogenic Operations Group Leader of refrigerator status and that cooling to ring will be stopped.

_____ 5.3.2 Shutdown cold turbines.

_____ 5.3.3 Stop flow to the ring by closing valve H86A, continue to operate the ring circulators.

_____ 5.3.4 Ensure main compressors are operating to provide pump back. Opening limit on valve H3025A may need to be increased.

_____ 5.3.5 To isolate the low pot, close the following valves (remove air lines from valves and red tag):

H114A____ H86A____
H58A____

_____ 5.3.6 If possible, stabilize the warm end of the refrigerator. If not, shut down the warm turbines.

_____ 5.3.7 Ensure issue that caused disk to fail is being addressed.

_____ 5.3.8 When venting from the pot subsides, replace failed burst disk with spare assembly. Monitor pressure of pot as spare assembly is installed.

_____ 5.3.9 Heat area of burst disk and retighten bolts.

Caution:
While bringing refrigerator systems back on line, closely monitor temperatures and pressures.

_____ 5.3.10 Evaluate status of refrigerator warm end, including adsorber.

_____ 5.3.11 If shutdown, restart warm turbines.

_____ 5.3.12 Remove red tag, reinstall air line, and place valve H58A in "Auto."

_____ 5.3.13 Adjust valve H100A opening limit to control pot filling rate.

_____ 5.3.14 Remove red tag, reinstall air line, and partially open valve H114A while monitoring pot pressure.

_____ 5.3.15 Place valve H114A in "Auto."

_____ 5.3.16 Restart cold turbines.

_____ 5.3.17 Remove red tag and reinstall air line for valve H86A.

_____ 5.3.18 To re-establish flow to the ring, match set point of valve H86A to supply line pressure.

_____ 5.3.19 Place valve H86A in "Auto."

_____ 5.3.20 Increase supply line pressure by adjusting set point of valve H86A. Monitor flow rate to ring.

_____ 5.3.21 Stabilize ring and refrigerator.

5.4 Replacement of Burst Disk H46R (CVP to HX Piping)

_____ 5.4.1 Notify MCR and Cryogenic Operations Group Leader of refrigerator status and that cooling to ring will be stopped.

_____ 5.4.2 Shutdown cold turbines.

_____ 5.4.3 Shutdown cold vacuum pumps.

_____ 5.4.4 Stop flow to the ring by closing valve H86A, continue to operate the ring circulators.

_____ 5.4.5 Close valve H100A to stop flow to pots.

_____ 5.4.6 Ensure main compressors are operating to provide pump back. Opening limit on valve H3025A may need to be increased.

_____ 5.4.7 Ensure the following valves are closed:

H158M____	H34M____
H399M____	H33A____
H799M____	H26A____

_____ 5.4.8 To provide a return path for the ring and pots, ensure the following valves are open:

H409M____ (If "A" Train Operating)	H130M____
H809M____ (If "B" Train Operating)	H168M____
H238M____	H31A____
H123A____	

_____ 5.4.9 Close and apply LOTO to cold vacuum pump valves H200M____ and H450M____.

_____ 5.4.10 Close, physically block from opening and red tag valves H40A____ and H33A____.

_____ 5.4.11 Close, remove air line and red tag valve H38A.

_____ 5.4.12 If possible, stabilize the warm end of the refrigerator. If not, shut down the warm turbines.

_____ 5.4.13 Ensure issue that caused disk to fail is being addressed.

_____ 5.4.14 When venting subsides, replace failed burst disk with spare assembly. Monitor pressure as spare assembly is installed.

_____ 5.4.15 Heat area of burst disk and retighten bolts.

Caution:
While bringing refrigerator systems back on line, closely monitor temperatures and pressures.

_____ 5.4.16 Evaluate status of refrigerator warm end, including adsorber.

_____ 5.4.17 If shutdown, restart warm turbines.

_____ 5.4.18 Remove red tag, reinstall air line, and open valve H38A.

_____ 5.4.19 Remove red tag and physical block from valve H40A and place in "Auto."

_____ 5.4.20 Remove LOTO and open valves H200M____ and H450M____.

_____ 5.4.21 Remove red tag and physical block from valve H33A and leave closed.

_____ 5.4.22 Close valves H123A____ and H409M____ [H809M____].

_____ 5.4.23 Open valve H26A.

_____ 5.4.24 Adjust valve H100A opening limit to control pot filling rate.

_____ 5.4.25 Place H100A in "Auto."

_____ 5.4.26 Restart cold turbines.

_____ 5.4.27 Remove red tag and reinstall air line for valve H86A.

_____ 5.4.28 To re-establish flow to the ring, match set point of valve H86A to supply line pressure.

_____ 5.4.29 Place valve H86A in "Auto."

_____ 5.4.30 Increase supply line pressure by adjusting set point of valve H86A. Monitor flow rate to ring.

_____ 5.4.31 Restart cold vacuum pump.

_____ 5.4.32 Stabilize ring and refrigerator.

6. Documentation

6.1 The check-off lines on the procedure are for place-keeping only. The procedure is not to be initialed or signed, it is not a record.

6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenic Control Room Log.

7. References

7.1 Drawing 3A995009, "RHIC Cryogenic 25 KW Helium Refrigerator P&ID

8. Attachments

None